

SECTION 02444
CHAIN-LINK FENCE

PART 1 - GENERAL

0.1 DESCRIPTION OF WORK

- A.** Work Included: This Section specifies the furnishing and installation of chain-link fence and gates, of the following types:
1. Type I: Galvanized Steel
 2. Type II: Aluminum-Coated Steel Fabric with Galvanized Steel Posts, Hardware, and Fittings
 3. Type III: (not used)
 4. Type IV: Colored PVC-Coated Steel Fabric with Galvanized and Factory-Painted Steel Posts, Hardware, and Fittings
- B.** Related Work: The following items are not included in this Section and will be performed under the designated Sections:
1. Section 03300 - CAST-IN-PLACE CONCRETE.
 2. Section 05500 - MISCELLANEOUS METALS
 3. Section 09900 - PAINTING
 4. Section 16450 - GROUNDING.

0.2 SUBMITTALS

- A.** Shop Drawings:
1. Include cross sectional dimensions of posts, braces, rails, fence fabric, fittings, accessories and gate frames; design of gates; and details of all gate hardware.
 2. Include a layout drawing showing the spacing of posts and location of all gates; abrupt changes in grade; and all corner, gate, anchor, end, and pull posts.
- B.** Certificates. Submit certified test reports giving results of tests specified herein for zinc and vinyl coatings.

PART 2 - PRODUCTS

0.1 MATERIALS

A. General: Comply with AASHTO M181, with the additions and modifications specified herein.

1. Aluminum alloy line, end, and corner posts, and top rail, may be substituted for galvanized steel at the Contractor's option.
2. Aluminum Alloy: ASTM B221 for shapes, and B429 for pipe, Alloy 6061-T6. Pipe dimensions specified are the nominal pipe sizes per ASTM B429 Schedule 40. Coat portions of posts to be embedded in concrete with two coats of an accepted coal-tar mastic, allowing 24 hours drying time between coats.
3. Steel pipe dimensions and weights: ASTM A120, Schedule 40. Dimensions specified are the nominal pipe sizes.
4. Dimensions and weights specified herein are subject to a tolerance of plus or minus five percent.
5. Zinc Coating: Minimum 2.0 ounces per square foot except where specified otherwise.
6. Provide posts with accepted tops of same material as posts, so designed as to fit securely over post and carry top rail or cable; the base of top fitting shall carry an apron around outside of post.

B. Line Posts

1. Steel, Five Feet and Shorter: 1-1/2 inch pipe; or 1.625 by 1.875 inch H column weighing 2.70 pounds per foot; or 1.625 by 1.875 inch C column weighing 2.20 pounds per foot.
2. Aluminum, Five Feet and Shorter: 1.625 by 1.875 inch H column weighing 1.03 pounds per foot.
3. Steel, Over Five Feet: 2 inch pipe; or 1.95 by 2.25 inch H column weighing 4.10 pounds per foot; for 1.70 by 2.25 inch C column with a weight of 2.66 pounds per foot.
4. Aluminum, Over Five Feet: 2 by 2.25 inch H column weighing 1.24 pounds per foot.

C. Gate Posts: Steel, minimum 3-1/2 inch pipe, except as otherwise specified in the Construction Specifications.

D. End and Corner Posts

1. Steel, Five Feet and Shorter: 2 inch pipe, or 3.5 inch square C column weighing 5.163 pounds per foot.
2. Aluminum, Five Feet and Shorter: 2 inch pipe.
3. Steel, Over Five Feet: 2.5 inch pipe, or 3.5 inch square C column weighing 5.163 pounds per foot.
4. Aluminum, Over Five Feet: 2.5 inch pipe.

E. Top Rail, Cables, and Spring Tension Wire

1. Top Rail

- a. Steel: 1-1/4 inch pipe, or 1.25 x 1.625 inch C section weighing 1.262 pounds per foot.
 - b. Aluminum: 1.25 inch pipe.
 - c. Couplings and Expansion Sleeves: Outside sleeve type, minimum six inches long.
2. Cable: ASTM A475, 3/8 inch, seven-strand, common grade, Class A galvanizing.
3. Cable attachments
 - a. Shoulder Eye Bolts: 5/8 inch diameter, of sufficient length to fasten to the post used.
 - b. Turnbuckles: Shackle end type, 1/2 inch diameter, with six-inch standard take-up and 3/8 inch diameter pins.
 - c. Thimbles: lightweight wire rope for use with 3/8 inch diameter cable
 - d. Wire Rope Clips: U-bolt diameter of 7/16 inch for use with 3/8 inch diameter cable.
 - e. Anchor Shackles: 3/8 inch diameter, 11/16 minimum distance between eyes, 7/16 inch pin diameter.
 - f. Seizing: 0.0181 inch diameter galvanized annealed iron wire.
4. Spring Tension Wire: Coil spring steel, 0.1770 inch diameter; base metal having a minimum tensile strength of 80,000 psi, galvanized with 1.6 ounces per square foot; or aluminum coated with 0.4 ounces per square foot.

F. Braces and Tension Rods

1. Compression Braces: Same type and size as top rail.
2. Tension Rods: 3/8 inch round rods with drop-forged turnbuckles or other approved type of adjustment.

G. Fence Fabric

1. Type I, Galvanized Steel: ASTM A392, Size 9, Class 2 coating.
2. Type II, Aluminum-Coated Steel: ASTM A491, Size 9.
3. Type IV, PVC-Coated Steel: ASTM A392, Size 9, except with PVC coating in lieu of galvanizing.
4. Selvages, all Types
 - a. Fabric 60 inches high and under: knuckled at both selvages.
 - b. Fabric over 60 inches high: knuckled at one selvage and twisted and barbed at the other.

H. Fabric Band and Stretcher Bars

1. Fabric Band: Minimum 1/8 by 3/4 inch section.
2. Stretcher Bars: Minimum 1/4 by 3/4 inch section.
3. Aluminum Alloy Items: ASTM B221, 6061-T6.

I. Tie Wire and Miscellaneous Items

1. Tie Wire: Galvanized or aluminum-coated 0.148 inch steel wire, or aluminum alloy conforming to ASTM B211, 1100-H14.

2. Hog Rings: Galvanized or aluminum-coated 0.120 inch steel wire, or aluminum conforming to ASTM B221, 6061-T6. Aluminum coating: minimum 0.24 ounces per square foot.
3. Post Clips: Galvanized or aluminum-coated 0.192 inch steel wire, or aluminum alloy conforming to ASTM B211, 1100-H14. Aluminum coating: minimum 0.30 ounces per square foot.

J. Barbed Wire and Extension Arms

1. Barbed Wire: ASTM A121, 12-1/2 gauge, 4-point round barbs, Class 3 coating.
2. Extension Arms: Projecting at an angle of approximately 45 degrees, fitted with clips or other means of attaching three strands of barbed wire, the top outside wire approximately 12 inches from the fence line and the other wires spaced uniformly between the top outside wire and the fence fabric.

K. Gates

1. General. Furnish gates complete with necessary hinges, latches, and drop bar locking devices; corners shall be welded or fastened and reinforced with suitable fittings.
2. Gates Frames, Six Feet and Under: 1-1/4 inch steel pipe or aluminum tubing.
3. Gate Frames, Over Six Feet; 1-1/2 inch steel pipe or aluminum tubing.
4. Cross-Trussing: 3/8 inch galvanized iron adjustable rods.

L. Concrete: Section 03300 - CAST-IN-PLACE CONCRETE, Class 4000, 3/4.

PART 3 - EXECUTION

0.1 INSTALLATION

- A.** Place posts at each corner, change of direction, abrupt change in grade, gate, and terminal, in addition to line and pull posts.
- B.** Space line posts on not more than 10-foot centers. In determining the posts spacing, measure parallel to slope of finished grade. Place all posts in vertical position except in unusual locations where the Engineer may require otherwise.
- C.** Where fencing is installed on the top of concrete structures, use galvanized sleeve and grout posts or install with suitable flange casings and galvanized anchor bolts. Set all other posts permanently in concrete.
- D.** Coat aluminum posts with material specified for protection of dissimilar metals as specified in Section 05500 - MISCELLANEOUS METALS, from bottom to two inches above concrete prior to embedment, and touch-up such coated areas in accordance with requirements of Section 09900 -

PAINTING, after concrete is cured. Similarly protect bottoms of aluminum anchor plates that will be in contact with concrete.

- E.** Excavate post hole footings not smaller than 12 inches in diameter and 36 inches deep. Crown top of concrete to shed water, and allow to cure not less than 72 hours before proceeding with further work on the posts. Backfill posts with acceptable material placed in layers and thoroughly compacted. Embed galvanized steel eye bolts in the top of footings, adjacent to the posts, to receive the bottom tension wire.
- F.** Brace end, corner, pull, and gate posts to the nearest line post, with diagonal or horizontal brace rails used as compression members, and with truss rods with turnbuckles used as tension members. Brace line posts horizontally and truss in both directions as required, at approved intervals.
- G.** Fasten fabric to outer face of posts, except where a property owner's existing fencing occurs directly against and adjacent to the Authority's fencing, fasten chain-link fabric to the inner face of posts. Stretch and securely fasten fabric to posts, rails, and top and bottom tension wire with either tie wires or metal bands. Stretch tension wires tight with turnbuckles spaced at not more than 1,000 foot intervals. Install bottom tension wire on straight grade between posts by excavating the high points of ground; in no case will filling of depressions be permitted. Fasten fabric to end, corner, pull, and gate posts with stretcher bar bands spaced at one foot intervals. Place fasteners at approximately 14 inch intervals on pipes and at approximately 18 inch intervals on tension wires. Insure that the bottom tension wire is installed so that the fence fabric selvage is not more than one inch from the surface of the ground or top of concrete, except where special closures at ground depressions are indicated. Run the bottom tension wire through eye bolts installed in the footing or top of wall at each post.
- H.** Install barbed wire on extension arms as indicated. Pull each wire taut, and make entire assembly secure. Attach wire to end, corner, pull, and gate posts with stretching bands.
- I.** Provide steel angle metal closures where finish ground surface is more than one inch below the bottom tension wire. Bolt steel angle to fence posts, and install the reinforcing rods and bracing members as approved. Install rods of accepted length vertically. Where drainage ditches cross the fence line, provide concrete ditch lining and steel reinforcing bar grille.
- J.** Electrical Ground. Where a power line carrying more than 600 volts passes over fence, install ground rod at the nearest point directly below each point of crossing. Ground all substation fences and gates and perform other electrical grounding as indicated and as specified in Section 16450 - GROUNDING.

0.2 TOUCH-UP AND REPAIR WORK

- A.** Remove and replace fencing which is improperly located or is not true to line, grade and plumb within tolerances as indicated.
- B.** Repair damaged vinyl-coated components as recommended by the manufacturer.

PART 4 - MEASUREMENT AND PAYMENT

0.1 MEASUREMENT

- A.** Chain-link fence will be measured by the linear foot of each type and height complete in place, parallel to finished grade from center to center of end posts.
- B.** Gates will be measured by the linear foot of each type and size complete in place.
- C.** Electrical grounding will be measured and paid for as specified in Section 16450 - GROUNDING.
- D.** Earthwork, grout and concrete, barbed wire, and metal closures to ground will not be separately measured and paid for, but all costs therefore will be considered incidental to chain-link fence and gates.

0.2 PAYMENT

- A.** Chain-link fence and gates will be paid at the Contract unit price for the quantities determined as specified above.

0.3 PAYMENT ITEMS

ITEM NO.	DESCRIPTION	UNIT
0271.072	72" CHAIN LINK FENCE	LF
0271.096	96" CHAIN LINK FENCE	LF
0271.272	72" CHAIN LINK FENCE GATE WITH POSTS	LF
0271.292	96" CHAIN LINK FENCE GATE WITH POST	LF
0271.048	48" CHAIN LINK FENCE WITH POSTS	LF

END OF SECTION

NOTES TO THE DESIGNER

- A.** Any request to modify or waive the specification requirements listed below must be approved in writing by the MBTA's Director of Design:

1. None